U.S. Energy Information Administration

‹ Countries

South Africa

Last Updated: January 17, 2013 (Notes)

full report

Overview

South Africa has one of the world's largest synthetic fuels industries, which accounts for nearly all of its domestic liquid fuels supply.

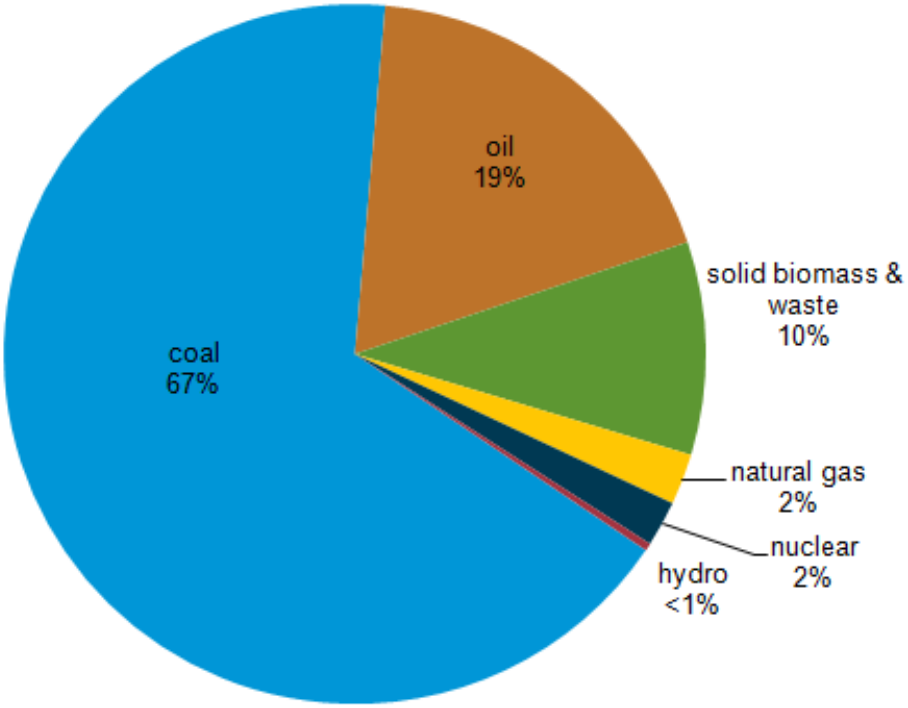
South Africa's energy sector is critical to the economy as the country relies heavily on its large-scale, energy-intensive mining industry. South Africa has only small deposits of conventional oil and natural gas and uses its large coal deposits for most of its energy needs, particularly in the electricity sector. Most of the oil consumed in the country, used mainly in the transportation sector, is imported from large producers in the Middle East and West Africa and is locally refined. South Africa also has a highly developed synthetic fuels industry, producing gasoline and diesel fuels from coal and natural gas. The synthetic fuels industry accounts for nearly all of the country's domestically produced petroleum since crude oil production is trivial.

The economy has grown rapidly since the end of the apartheid era in 1994 and is now one of the most developed nations in Sub-Saharan Africa. Despite this rapid growth, economic problems from the apartheid era remain, particularly poverty and lack of economic participation among the disadvantaged groups. The South African government has committed to ensuring that black-owned companies have access to the energy sector under its black economic empowerment (BEE) program. Additionally, the 2000 Petroleum and Liquid Fuels Charter sets a target to place 25 percent of the oil sector in the hands of black-controlled energy companies.

According to a recent EIA study, South Africa could hold significant shale gas resources. In April 2011, the government enacted a moratorium on licensing and exploration on shale resources due to environmental concerns over hydraulic fracturing and water usage. In September 2012, the government lifted the moratorium and some international companies, such as Royal Dutch Shell, have already submitted applications to explore the shale region. The South African government hopes that shale gas will provide the country with a reliable fuel alternative to coal, particularly since natural gas is less carbon intensive.

In 2010, almost 70 percent of South Africa's total energy supply came from coal, followed by oil (19 percent) and solid biomass and waste (10 percent), according to EIA estimates. South Africa's energy balance also includes relatively small shares of natural gas, nuclear, and hydroelectricity. South Africa's dependence on hydrocarbons, particularly coal, has led the country to become the leading carbon dioxide emitter in Africa and the 12th largest in the world, according to the latest 2010 EIA estimate.

Total primary energy supply in South Africa, 2010



eia Source: U.S. Energy Information Administration

Source: CIA Factbook.

Energy sector organization

Regulation

South Africa has numerous government agencies and companies involved in the coal, natural gas, and oil industry, but the National Energy Regulator of South Africa (NERSA) is the industry regulator and is responsible for implementing South Africa's energy plan. The energy plan is centered on diversifying energy sources, securing energy supplies, and pushing forward new energy projects across sectors.

The electricity sector also falls under the regulation of the NERSA. Eskom, (the state electricity company) is responsible for electricity transmission and generates 95 percent of South Africa's electricity. NERSA regulates electricity prices and promotes private sector participation by encouraging investment on the part of independent power producers (IPPs), as well as promotes off-grid technologies to meet rural energy needs.

Major Companies

South Africa's upstream oil and gas sector is dominated by the state-owned company Petroleum Oil and Gas Corporation of South Africa (PetroSA), while the downstream oil sector is more diversified and includes companies from Europe, North America, and Asia. Sasol, a South African-based company, is also an important player in South Africa's energy sector, particularly in coal liquefaction.

PetroSA operates all upstream oil and gas assets in South Africa, along with the Gas-to-Liquids (GTL) plant in Mossel Bay. The company also participates in upstream projects regionally, with its most recent endeavors consisting of purchasing a small stake in Ghana's deepwater Jubilee field and signing a cooperation agreement with the Democratic Republic of Congo (DRC)'s Cohydro for joint oil exploration. The company has also invested in oil and gas exploration in Egypt, Nigeria, Gabon, Equatorial Guinea, and Namibia, but has had little success so far.

Sasol is another major player in South Africa's energy industry and operates Secunda, the world's only coal-based synthetic fuels plant (outside of China). The company holds majority interest in the Natref refinery, the smallest crude oil refinery in the country. Aside from its home base, Sasol has operations all around the world, ranging from supplying petrochemicals in Asia to using its proprietary Fischer-Tropsch conversion technology to pursue opportunities to open GTL plants in Uzbekistan, Canada, United States, Australia, China, and India. On December 3, 2012, Sasol announced that it will begin a front-end engineering and design (FEED) phase for a 96,000 barrels per day (bbl/d) GTL plant at Lake Charles, Louisiana. The project will also include a world-scale ethane cracker with downstream derivatives, according to a company press release. Additionally, in 2011, Sasol joined shale gas exploration in Canada by acquiring a 50 percent stake in Talisman Energy's natural gas assets in the Montney shale gas resources found in British Columbia.

South Africa has a number of international companies participating in coal mining, along with the petroleum refinery and marketing sector. BP, Shell, Chevron, Total, and Engen are the main players in the downstream oil and petrochemical industry. Anglo American, BHP Billton, and Xstrata Coal are the top international coal producers in the country, while the South African-based, majority black-owned, coal company Exxaro also ranks amongst the top producers.

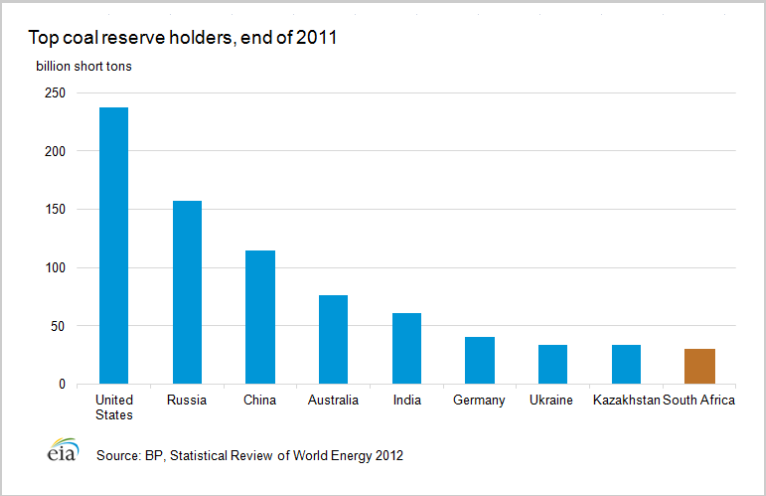
Coal

South Africa has the world's ninth largest recoverable coal reserves and holds 95 percent of Africa's total coal reserves. Additionally, it is the fifth largest coal exporter in the world.

South Africa's economy is heavily dependent on coal, and EIA estimates show that nearly 70 percent of the country's total primary energy supply is derived from coal. According to the 2012 BP Statistical Review, South African proven coal reserves were estimated at 30.2 billion short tons by the end of 2011, accounting for 95 percent of total African coal reserves and almost 4 percent of total world reserves.

Production and consumption of coal has remained relatively stable over the past decade. In 2011, the country produced an estimated 282 million short-tons (MMst) and consumed 210 MMst. Most of the coal produced comes from the Witbank, Highveld, and Ermelo coalfields, which are located in the eastern part of the country near Swaziland. According to a report written by Anton Eberhard at Stanford University, coal production in the Central Basin is expected to peak in the next decade, while increased exploration at the Waterberg coalfield could result in more coal for the country's future, but this is subject to infrastructure and water constraints. The report also states that about 70 percent of domestic coal consumption (excluding exports) is used for electricity generation by Eskom, while the remainder is used to supply Sasol's CTL plant (20 percent), metallurgical industries (3 percent), small merchants and residential areas (2 percent), and other industries (5 percent).

Environmental groups continue to target the industry for air, land, and water pollution through all of the industry's stages from extraction to end use. Nonetheless, coal use — especially by Eskom and Sasol — is expected to rise over the next few years. Eskom plans to expand coal-fired electricity capacity to meet growing demand. It recently returned to service the 1,430 megawatts (MW) Camden power station and plans to return to service two other coal-fired power stations: Grootvlei (950 MW) and Komati (284 MW). The company is also constructing the Medupi power station (4,788 MW), whose first unit is expected to begin generation in 2013.



Coal-to-liquids (CTL)

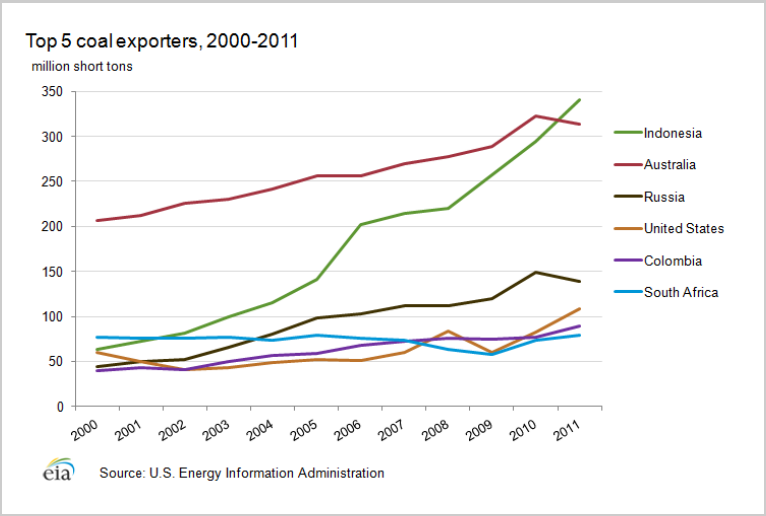
In addition to power generation, the country produces synthetic fuels from low-grade coal and a small amount from natural gas. At the Sasol synfuels plant in Secunda, around 45 million short tons a year are converted into liquid fuels, gas, and other products. The plant

has a capacity of 160,000 bbl/d of oil equivalent and is the world's only commercial coal-to-liquids plant in operation. Sasol plans to expand Secunda's capacity by another 30,000 bbl/d and has proposed to build the 80,000 bbl/d CTL Mafutha plant. Any future increases in CTL synthetic fuels will be used to meet growing domestic demand for petroleum products. Currently about 30 percent of South Africa's gasoline and diesel needs are produced from coal, according to the World Coal Association.

Exports

The Richards Bay Coal Terminal (RBCT), located on the eastern coast of South Africa, is one of the world's largest coal export terminals. It began operations with a capacity of 12 million tons per year in 1976, and has since gone through several capacity expansions, which have increased the export terminal's design capacity to its current 91 million tons per year. According to Eberhard's report, there are proposals to expand the RBCT in the future, but these plans are constrained by inadequate rail capacity to transport coal produced at inland coalfields to the RBCT.

According to statistics provided by RBCT, as of November 2012, the annualized rate of coal received at the terminal is 68.2 million tons per year, and as a result, the terminal operates at about 25 percent below its designed capacity. The lack of railway capacity expansions needed to take advantage of RBCT's capacity expansions have resulted in a weakening of South Africa's world export position, as the country fell from the second leading coal exporter in the world in 2000 to the sixth in 2011. Despite the fall in world rank, the volume of coal South Africa exports has stayed relatively stable over the last decade. Exports are mostly sent to China, India, and Europe.



Natural gas

South Africa is the sole importer of natural gas from Mozambique, which is used to supply Sasol's operations at the Secunda CTL plant and power some gas-fired plants. The gas supplied to the Mossel Bay GTL plant is domestically produced offshore.

In 2011, South Africa produced 45 billion cubic feet (Bcf) of natural gas and consumed 162 Bcf; the remainder 117 Bcf was imported from Mozambique via pipeline. South Africa has very limited and declining conventional natural gas reserves, but potentially large shale gas resources. Most of the natural gas is produced from the maturing offshore F-A field and

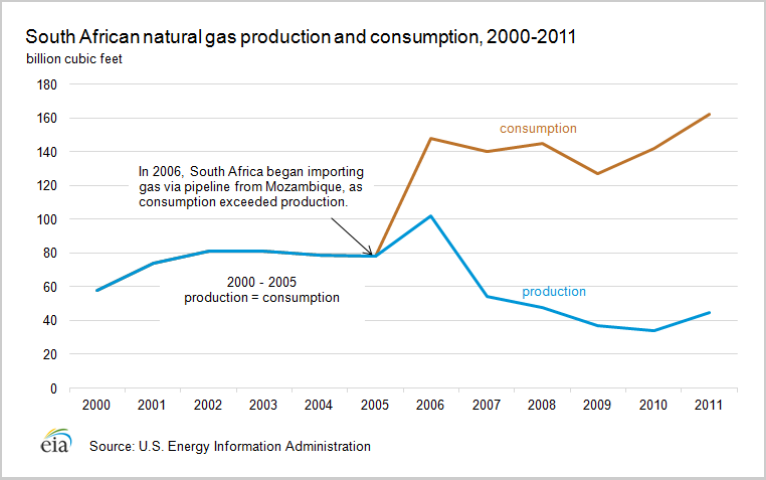
South Coast Complex fields and sent to the GTL facility in Mossel Bay via an offshore pipeline.

PetroSA is developing the F-O field, also known as Project Ikhwezi, to sustain gas supplies to the GTL facility. Reserves are estimated at almost 1,000 Bcf, and the field is expected to come online in the second half of 2013, according to PetroSA. The company expects gas production to continue for six years at the F-O field, but it plans to tap into nearby prospective areas to continue gas flows to the GTL plant.

PetroSA is also planning to develop the Ibhubesi gas field and expects first production in 2016. The government hopes that new gas production from the F-O and Ibhubesi fields and regional imports from Mozambique, coupled with potential gas imports from Namibia in the future, will reduce the country's reliance on coal, particularly in the electricity and industrial sector. Currently, infrastructure constraints limit the role of natural gas in the country's electricity sector.

According to recent analysis by EIA and Advanced Resources International, South Africa has 485 trillion cubic feet of technically recoverable shale gas resources, most of which are located in the Karoo Basin. The development of these reserves requires investments in exploration and several international companies have obtained permits to explore the region. However, environmental concerns regarding water usage and hydraulic fracturing, one of the processes used to facilitate the extraction of shale gas, led the government to enact a moratorium in April 2011 on permitting new exploration licenses for shale gas exploration. The moratorium was lifted in September 2012 after a government-funded study recommended that it was safe to continue shale gas exploration.

The Petroleum Agency South Africa (PASA), a government agency, has issued companies technical cooperation permits (TCPs) in the past, which authorize research into shale gas potential. However, companies are awaiting approval to convert their TCPs to exploration licenses, according to *Oil and Gas Journal* (O&GJ). Shell has three pending exploration license applications and Falcon Oil and Gas Ltd. and Bundu Gas & Oil have one each. O&GJ reported that Shell plans to spend $200 million to drill 6 wells in the first stage of exploration pending government approvals. Additionally, Chevron signed a five-year joint venture with Falcon Oil and Gas Ltd. in December 2012 to explore the area covered in Falcon's TCP located in the southern Karoo Basin. In order to mitigate concerns over water usage, the government requires that shale gas developers must obtain permits for sourcing and discharging water from the Department of Water Affairs, according to O&GJ.



Gas-to-liquids (GTL)

The GTL plant at Mossel Bay was commissioned in 1992 and is one of the largest in the world. PetroSA operates the plant, in addition to the offshore gas fields that provide the feedstock. The refinery has the capacity to process 45,000 bbl/d of oil equivalent through a Fischer-Tropsch Process in which natural gas is converted to synthetic liquid fuels. The plant produces several synthetic products, of which more than half is unleaded petrol (motor gasoline) and the remainder includes: kerosene (paraffin), diesel, propane, liquid oxygen and nitrogen, distillates, eco-fuels, process oils and alcohols.

Natural gas pipelines

Natural gas from Mozambique is imported through the 535-mile Sasol Petroleum International Gas pipeline and transported to Sasol's Secunda synfuels plant. Sasol, the South African government, and the government of Mozambique own the pipeline through a joint venture. The pipeline has a peak capacity of 524 million cubic feet per day (MMcf/d) of natural gas and was part of a $1.2-billion natural gas project started in 2004. It is designed eventually to be able to transport double its current capacity.

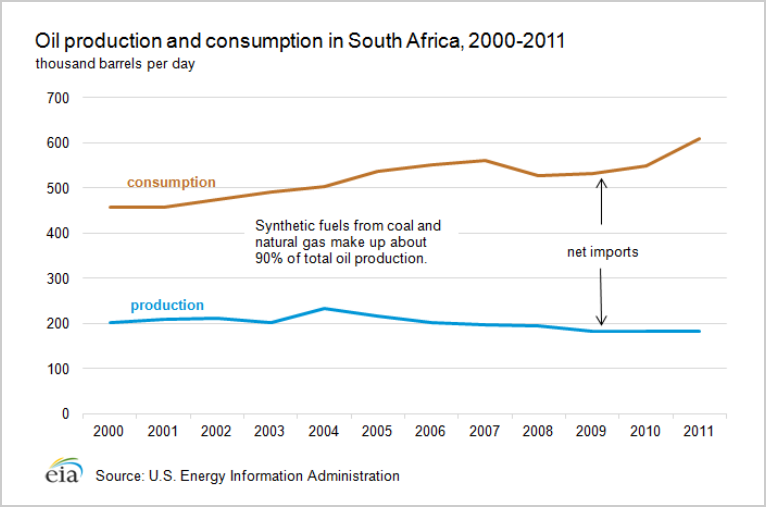
Sasol and Shell have proposed to build a second regional pipeline, connecting Namibia's offshore Kudu gas field to both PetroSA's Mossel Bay GTL plant and continuing on to PetroSA's planned oil refinery in Coega to feed a power station. However, plans to construct the pipeline have been halted due to investment challenges to develop the Kudu gas field.

Oil

South Africa has the second largest crude oil refinery system in Africa and imports the majority of its crude oil from members of the Organization of the Petroleum Exporting Countries (OPEC).

According to O&GJ, South Africa had proven oil reserves of 15 million barrels as of the end of 2011. All of the proven reserves are located offshore southern South Africa in the Bredasdorp Basin and off the west coast of the country near the border with Namibia. South Africa's total oil production is around 180,000 bbl/d; however, synthetic fuels, derived from coal and natural gas, account for 160,000 bbl/d, or almost 90 percent of the country's domestic petroleum supply. Crude oil and lease condensate (2,000 bbl/d), natural gas liquids (4,000 bbl/d), and refinery processing gain (14,000 bbl/d) make up the remainder amount. Crude oil and lease condensate is produced at the Oribi and Oryz fields, which PetroSA operates. The country's crude oil and lease condensate production has declined over the last decade as oil fields continue to mature and no commercially viable discoveries have been found.

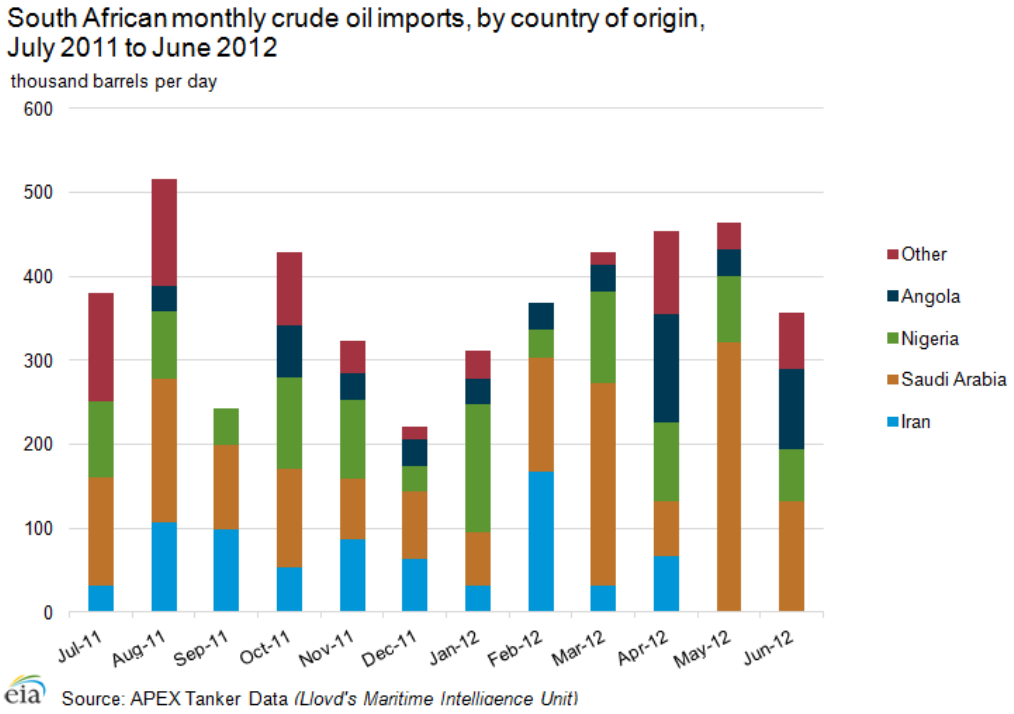
South Africa's offshore Orange Basin near Namibia is believed to hold substantial oil and gas reserves, although there has been limited exploration activity in the area. In 2009, Shell acquired exploration rights over a large block in the basin. However, Shell's exploration activities are still in the beginning stages and the company is years away from potentially exploiting any commercial reserves.

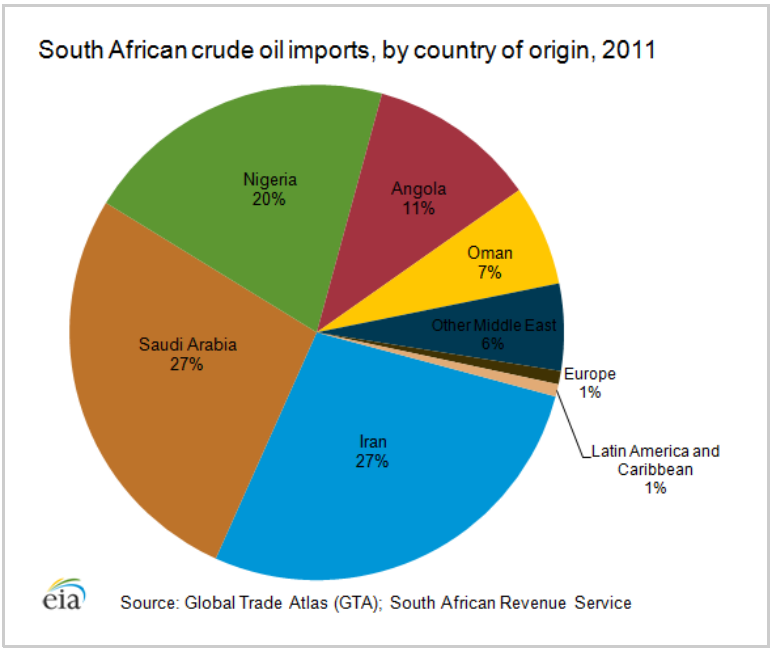


Oil imports

EIA estimates that South African total petroleum consumption was 610,000 bbl/d in 2011. The majority of South African crude oil imports are from OPEC countries, namely Iran (27 percent), Saudi Arabia (27 percent), Nigeria (20 percent) and Angola (11 percent), according to data from the Global Trade Atlas (GTA) based on figures from the South African Revenue Service. On the other hand, data tabulated from APEX Tanker Data (Lloyd's Maritime Intelligence Unit) shows that South Africa imported more oil via tankers from Saudi Arabia than Iran in 2011.

Despite the discrepancies in the trade data for 2011, South Africa's crude imports from Iran have unquestionably dropped in 2012 due to the most recent round of U.S.-led sanctions against the country. U.S. sanctions, directed toward foreign financial institutions that facilitate oil-related transactions with the Central Bank of Iran, entered into full force in July 2012. In order to avoid the sanctions, Iranian crude importers have to show or pledge significant reductions in their Iranian crude oil purchases to receive a 180-day renewable exemption. South Africa halted Iranian crude oil imports in May and was granted an exemption from the sanctions in June and again in December. At the time of writing this report, the country has not resumed imports from Iran and continues to substitute Iranian imports mostly with supplies from Saudi Arabia, as well as Angola.





Refining and downstream

EIA estimates show that South Africa imported almost 80,000 bbl/d of refined petroleum products in 2010, which has grown significantly from less than 10,000 bbl/d at the start of the decade. Currently, South Africa has the second largest crude oil refining capacity in Africa at 484,547 bbl/d of total oil, according to O&GJ 2012 estimates, surpassed only by Egypt (726,250 bbl/d – O&GJ). The country is planning to increase domestic refining capacity.

The government is planning to implement new tighter fuel standards by 2017 that would require upgrades at all refineries; however, due to low returns on investment, refinery operators are hesitant to upgrade their facilities. Furthermore, tariffs on refined product pipelines increased this year, as the government needed the additional funds to finance the

construction costs for a new multi-fuel pipeline between Durban and Johannesburg, which will replace the existing ageing infrastructure and increase pipeline capacity. The new fuel standards, coupled with the increase in pipeline tariffs, may raise refiners' operational costs.

PetroSA has been advocating for the construction of a new 400,000 bbl/d refinery at Coega near Port Elizabeth, known as Project Mthombo (also known as the Coega plant). If the project is built, the refinery would be made to meet the new fuel standards. According to PetroSA, the refinery could meet an 180,000 bbl/d shortfall in locally refined diesel and gasoline by 2020 that may occur if there is no significant investment in domestic refinery capacity. PetroSA and Sinopec are jointly funding a study for the construction of the refinery, although, at the time of writing this report, PetroSA is still waiting for government approval to begin the project.

South African Crude Oil Refinery Capacity, end of 2011

Refinery	Company	Location	Capacity (bbl/d)
Sapref	Shell BP	Durban	169,000
Enref	Engen Petroleum	Durban	118,000
Chevref	Caltex Oil SA (Chevron)	Cape Town	110,000
Natref	National Petroleum Refiners	Sasolburg	87, 547

Source: Oil & Gas Journal, January 2012

Oil transit

South Africa's Cape of Good Hope (Cape) is a significant transit point for oil tanker shipments across the globe. In 2011, flows around the Cape accounted for roughly 11 percent of all seaborne traded oil, or 6 percent of oil traded worldwide. According to APEX Tanker Data (Lloyd's Maritime Intelligence Unit), approximately 5.0 million bbl/d of seaborne traded oil moved across the Cape in both directions in 2012. Most of which moved from west to east around the Cape (3.5 million bbl/d), originating mostly from Africa (1.9 million bbl/d) and Latin America and the Caribbean (1.1 million bbl/d). West to east flows were nearly all destined for Asian markets (3.3 million bbl/d). In the opposite direction, nearly all east to west flows originated from the Middle East (1.4 million bbl/d), mostly destined for the Americas, with the United States making up a vast majority of the total. In 2012, westbound shipments around the cape fell by over 20 percent, most of which originated from the Middle East. The fall is mostly attributed to Europe, as the major importers on the continent replaced oil imports from the Middle East with imports from West Africa, namely Nigeria.

Oil transit via the Cape of Good Hope

Unit: million bbl/d	2010	2011	2012
Total	**5.4**	**5.3**	**5.0**
West to East	3.6	3.4	3.5
East to West	1.8	1.9	1.5

Origin			
West to East			
Africa	1.9	1.9	1.9
Latin America & Caribbean	1.0	1.1	1.1
Other	0.6	0.5	0.5
East to West			
Middle East	1.7	1.7	1.4
Other	0.2	0.2	0.1
Destination			
West to East			
Asia	3.4	3.2	3.3
Other	0.2	0.2	0.2
East to West			
Americas	1.4	1.6	1.4
Europe	0.4	0.3	0.06
Other	0.07	0.07	0.08

Notes: (1) Estimates may not add up to their totals due to differences in rounding. (2) Estimates for 2012 are year-to-date January to December, but estimates for December are preliminary.

Source: EIA estimates based on APEX Tanker Data (Lloyd's Maritime Intelligence Unit).

Electricity

South Africa's total electricity consumption has grown by about 20 percent over the last decade. The government has set out ambitious plans to expand the sector in an attempt to avoid another power crisis, which the country experienced in early 2008.

Despite having reached a 75 percent electrification rate nationwide, the highest in Sub-Saharan Africa, only 55 percent of the rural population has access to electricity (compared to 88 percent in urban areas). According to 2009 data from the International Energy Agency (IEA), these figures indicate that approximately 12.5 million people had no access to electricity.

Electricity demand continues to rise in South Africa and in recent years, has outstripped the available supply infrastructure to the point where the country suffered rolling blackouts, although improvements have taken place. The country's 2010 electricity strategy lays out plans to work on the country's electricity distribution structure and fast-tracking projects by independent power producers. There is also a considerable amount of investment in new power projects with targeted capacity additions of over 40,000 MW by 2030, which will include mostly coal, but also renewable and nuclear generating capacity.

In the short-term, the 1,430 MW Camden coal-fired power station was recently returned to service and two other coal-fired power stations (Grootvlei, 950 MW and Komati, 284 MW) were also re-commissioned and will return to service soon. Additionally, plans are underway for a 4,788 MW coal-fired plant (Medupi) and a 3,500 MW nuclear power station,

although the latter has been delayed for financial reasons as well as possible security concerns following the Fukushima nuclear incident in Japan. Eskom initially planned to commission the first unit of the Medupi power station in the first quarter of 2012, but this has been pushed back to 2013. South Africa has also fast-tracked the construction of a new 4,800 MW coal-fired power station (Kusile Power Station Project) and Eskom expects it will be completed in eight years. Eskom's capacity expansions, including the Medupi and Kusile power stations and the re-commissioning of Camden, Grootvlei, and Komati, could potentially bring online over 13,200 MW of new electricity capacity before the end of this decade. Additionally, Eskom also expects its 100-MW Sere wind farm to start generating power toward the end of 2013.

Eskom generates about 95 percent of South Africa's electricity and most of the remaining 5 percent is generated by municipalities and large companies, such as Sasol, who generate a portion of their own electricity to operate their facilities. The UK-based company Ipsa, the only independent power producer (IPP) in the country, operates the Newcastle gas-fired power plant. Although the South African government has said it is open to more IPPs joining the industry, the South African Independent Power Producers Association has noted that there are regulatory barriers that make it difficult to enter.

EIA estimates show that South Africa's total electricity consumption grew by 20 percent from 2000 to 2010, while installed capacity grew at a slower rate of 7 percent during that same time period. In late 2007 and early 2008, as a result of high economic growth and growing electricity demand, and in the absence of any new power plants, the country experienced a power crisis that resulted in several blackouts and threatened the power supply to many businesses, including the mining industry. According to news articles from the Economist and New York Times, gold, diamond, platinum, and coal producers had to temporally shut down underground mining activities for nearly a week since Eskom could not guarantee electricity supplies. The country also had to ration its electricity exports to neighboring countries, which it sends through the Southern African Power Pool (SAPP).

Currently, South Africa is recovering from a period of negative growth in 2009, and has registered a 3 percent growth rate for both 2010 and 2011, according to the World Bank. The OECD's African Economic Outlook expects economic growth to fall slightly to 2.8 percent in 2012 and rise to 3.6 percent in 2013, assuming increased foreign direct investment and domestic spending. If this scenario occurs, the growth in economic activity will further strain the electricity grid. Additionally, Eskom has already expressed concerns of a possible electricity shortage in 2013. Eskom hopes that the addition of the Medupi power station will curb the potential electricity shortfall it expects this year. However, Medupi's start-date has been repeatedly delayed and labor protests have recently disrupted work at the site.

To meet generation targets, and as a demand-side measure, electricity rates have been gradually increasing for all sectors, causing concern among the more energy-intensive industries as well as poorer households. South Africa has traditionally had low electricity costs; however, Eskom requested a 60 percent tariff increase in 2008 to help finance new projects and meet rising equipment costs. NERSA, the energy sector regulator, approved a total tariff increase of 27.5% for 2008/2009 and recently approved Eskom's request to increase tariffs by 20-25 percent annually for the next three years. However, the tariff was later revised down to 16 percent, according to an energy report by IHS Cera.

Eskom power stations and capacity

	Capacity		Capacity

Baseload	(MW)[1]	Other	(MW)[1]
Coal-fired stations		**Hydro-electric stations**	
Arnot	2,232	Colley Wobbles[2]	--
Duvha	3,450	First Falls[2]	--
Hendrina	1,865	Gariep	360
Kendal	3,840	Ncora[2]	--
Kriel	2,850	Second Falls[2]	--
Lethabo	3,558	Vanderkloof	240
Majuba	3,843	**Pumped storage schemes**	
Matimba	3,690	Drakensberg	1,000
Matla	3,450	Palmiet	400
Tutuka	3,510	**Gas/liquid fuel turbine stations**	
Return-to-service stations (coal)		Acacia	171
Camden	1,430	Ankerlig	1,327
Grootvlei	950	Gourikwa	740
Komati	284	Port Rex	171
Nuclear power station		**Wind Energy**	
Koeberg	1,830	Klipheuwel	3

Source: Eskom, Integrated Report 2011

[1] Capacity is defined as total net maximum capacity.

[2] These plants are operational, but Eskom does not include their total net maximum capacity for management purposes. The total nominal capacity at each plant is: Colley Wobbles (42 MW), First Falls (6 MW), Ncora (2 MW), and Second Falls (11 MW).

Notes

- Data presented in the text are the most recent available as of January 17, 2013.
- Data are EIA estimates unless otherwise noted.

Sources

- African Economic Outlook
- APEX (Lloyd's Maritime Intelligence Unit)
- BBC News
- Business Monitor International (BMI)
- Cedigaz
- CIA World Factbook
- Economist

- Engen
- Eskom
- Global Insight
- Global Trade Atlas (GTA)
- IHS Cera
- International Energy Agency
- Lloyd's APEX Marine Intelligence Unit
- Newsbase Africa Oil and Gas Monitor (Afroil)
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- Reuters
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- Shell
- Sasol
- Stanford University report (Anton Eberhard)
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- South African Petroleum Industry Association (SAPIA)
- South African Revenue Service
- U.S. Energy Information Administration
- World Coal Association